Ensuring A Sustainable Future: Energy Management for Wastewater and Water

Commercial Energy Auditing
"If you can measure it, you can manage it"

Augusta, Maine
March 18, 2010

efficiency MAINE

Leading the Way to a Brighter Future

Program of the Maine Public Utilities Commission

efficiencymaine.com

866-376-2463

Key Elements of Efficiency Maine Energy Audit Program

- Energy Audit
  - Auditors are Engineers, Certified Energy Mangers and Professional Engineers with Significant Practical Facility Experience.
- Prescription and Custom Cash Incentives
- Qualified Partners
- Small Business Loan Program
- Auditors are Engineers, Certified Energy Mangers and Professional Engineers with Significant Practical Facility Experience.

"No Cost" Small Business Energy Audit Requirements

- < 50 employees or $5 million in annual revenue
- Small Business and non- profits
- No facility engineers on staff
- Submit one year of energy bills
- One building, i.e. Town Hall or Public Works or Fire House
- Follow up in six months
- No schools or residential facilities
- Call 207-373-1330
- www.efficiencymaine.com/business_programs

Prescribed Cash Incentives

- For lighting, motors, air conditioning systems, etc. can be found at the following web site:
- **http://www.efficiencymaine.com/pdfs/Prescriptive-Cash-Incentives.pdf**.

Efficiency Maine Qualified Partners

- List of contractors, suppliers, engineers, etc. for your area
- Find a Qualified Partner by entering your zip code at the following web site:
- **http://gdsit.gdsassociates.com/efficiencymainesearch/**

The Small Business Low Interest Loan Program

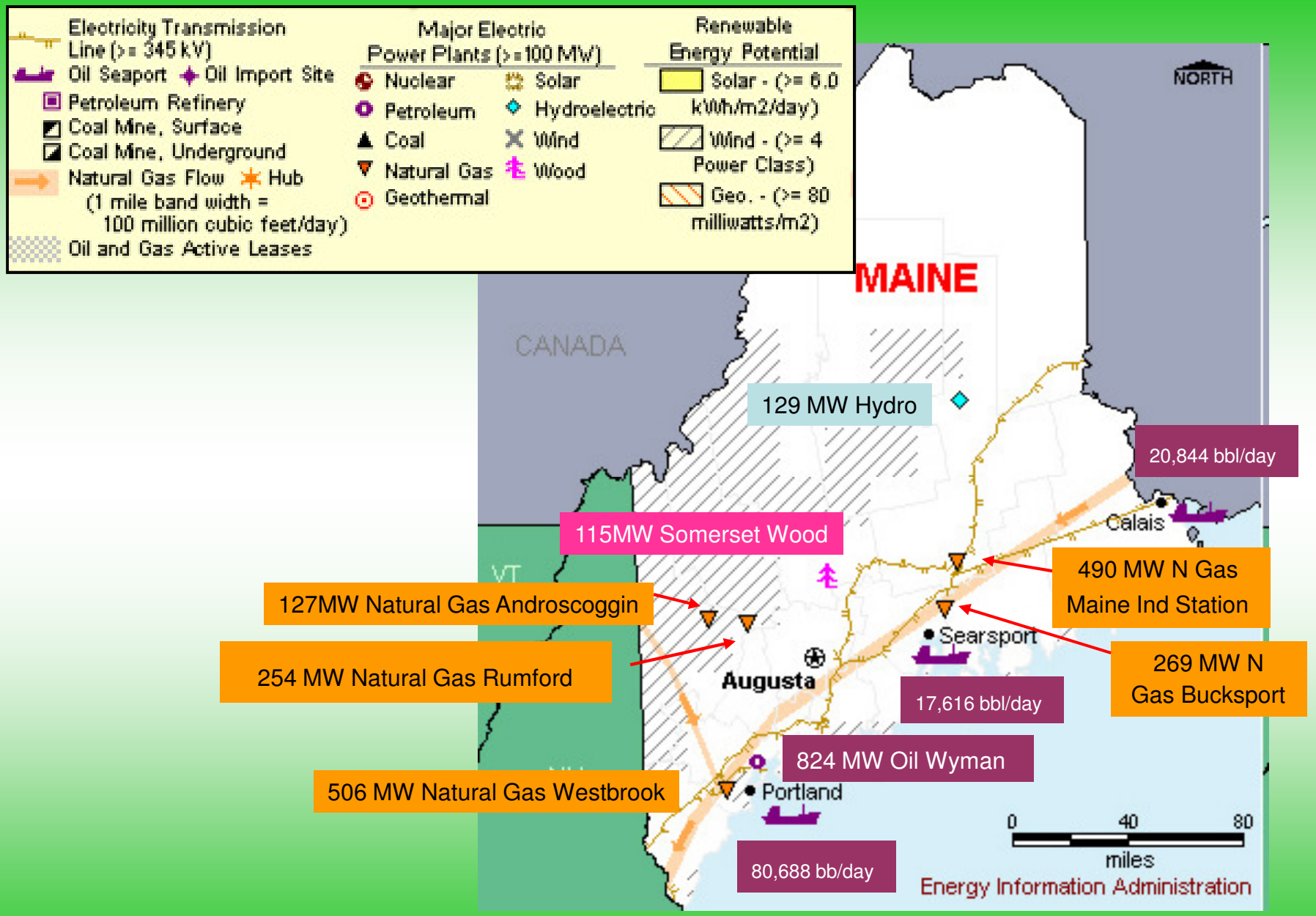
- To assist small commercial, non-profit, and manufacturing facilities with funding for Efficiency Maine-approved energy conservation measures by
- - providing loans up to $35,000
- - 1% interest (current fixed rate)
- Efficiency Maine Program administers this program. Additional information can be found at the following web site:
- http://efficiencymaine.com/business_programs_sblilp.htm

Guidelines

- $300,000 per business
- Measures that save electricity, but are not noted as a prescriptive incentive measure, may be eligible under the
  - **custom incentive program - Pete Laiho**.
- Efficiency Maine reserves the right to monitor and/or inspect the installation and energy use of the products for which incentives are paid.
- Efficiency Maine may publicize your participation in this program

Maine Power Production

Maine Power Plants Greater than 100 MW			
Power Plant	Fuel	MW	Homes
Wyman Station	Oil	824	98,095
Westbrook	Ngas	506	60,238
Independence Station	Ngas	490	58,333
Bucksport	Ngas	269	32,024
Rumford	Ngas	254	30,238
Great Lakes Hydro	Hydro	129	15,357
Androscoggin	Ngas	127	15,119
Somerset	Wood	115	13,690
	Total	2,714	323,095
Assume typical home uses 700 kWh's per month			
Inport	bb/day	gallon/day	
Portland	80,688	3,388,896	
Searsport	17,616	739,872	
Bucksport	20,844	875,448	



Efficiency Maine Small Business Energy Audit Program
"If you can measure it, you can manage it"

Practical Objectives

Learn…

- About Efficiency Maine small business basic energy audit program
- Importance of gathering and interpreting data to measure energy use
- Audit Examples as they pertain to prescriptive and custom cash incentives
- Audit Expectations

"Walk Through" Energy Audit Check List

- Up Front Energy Analysis
- Lighting
- Building Envelope
- Heating
- Domestic Hot Water
- Air Conditioning
- Ventilation
- Refrigeration
- Motors
- Electronic Equipment

Audit Expectations

- At least a years worth of energy date submitted
- Site visit
- Energy brief with leadership and management
- Tour facility with knowledgeable person
- Report includes:
  - Compilation and presentation of energy use data
  - Pictures and infrared pictures
  - Energy conservation measure recommendations
  - Identification of applicable incentives

This is why do we do energy audits !

British Thermal Unit

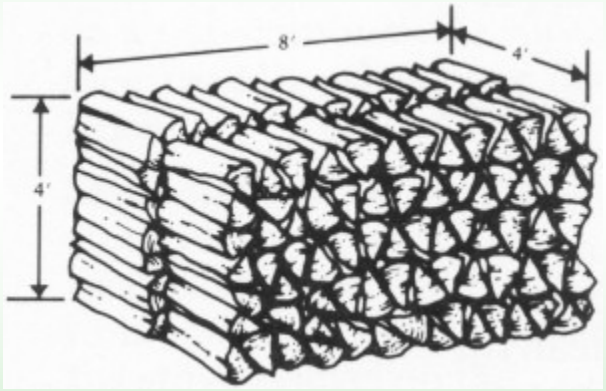
- BTU's provide heating and energy for your operation

- **Natural Gas 140,000 BTU's per gallon (100,000 BTUs per CCF)**
- **Fuel Oil 140,000 BTU's per gallon**
- **Propane 90,000 BTU's per gallon (~35% < NG and Oil)**
- **Electric 3,412 BTU's per KWH**

- Generally speaking, a BTU is the amount of heat required to raise the temperature of one pound of water 1 degree Fahrenheit.

BTU Perspective

- 1 cord of fire wood is approximately 22 million BTU's, therefore, it equals approximately:
  - 175 gallons of No. 2 oil
    - $440 @ $2.50 gallon
  - 250 gallons of propane
    - $690 @ $2.75 gallon
  - 6,500 kWh
    - $975 @ $.15 kWh



Energy

- **1 HP = 746 Watts**
  - 5HP motor x 746 = ~3,730 Watts or 3.7 KW
  - Does not account for PF or efficiency%
- Crude Oil - 5.1M BTUs per barrel (~36 gallons per barrel)
- Solar Panel Thermal - ~ 21,000 BTUs per panel

Success for Energy Savings

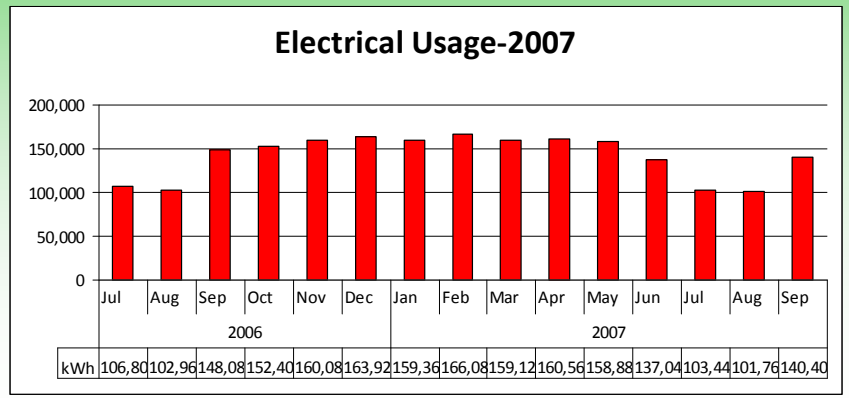
- Conduct a focused energy audit
- **"If you can measure it, you can manage it"**
- Document energy consumption for:
  - HVAC equipment
  - Motors
  - Lights and electronic equipment
- Identify cash incentives such as federal and state
- Evaluate energy conservation measures
- Prioritize based on payback
- Combine energy conservation measures to reduce payback
- **Earmark/fence** current energy budget to finance prioritized energy conservation measures for the length of payback

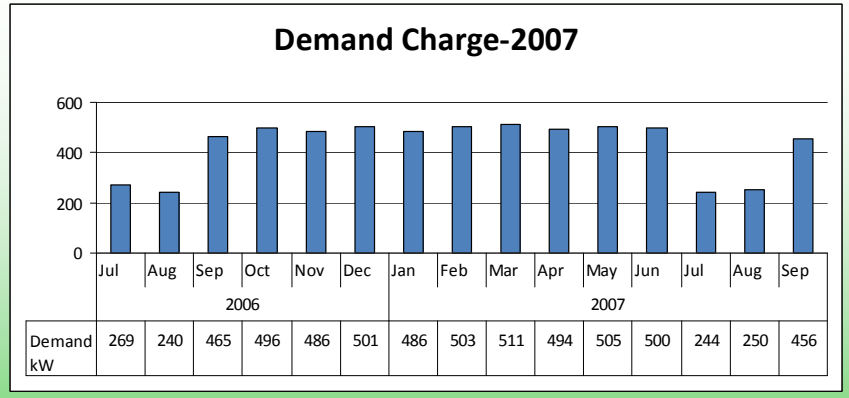
Energy Management

- First step, **"CRITICAL"** in energy management is to gather your energy usage data, assemble it and analyze
  - the more years--the better
- Review energy consumption on monthly basis
  - Monthly graphs are very helpful
- Make all users aware of energy consumption and cost on a regular basis
  - post it monthly on bulletin board
- **If you can measure it, you can manage it!**

Compile Electrical Usage

Electricity Usage-2006-2007					
		kWh	Cost	Demand kW	Demand Charge
2006	Jul	106,800	15,246	269	2,483
	Aug	102,960	14,658	240	2,329
	Sep	148,080	22,310	465	4,521
	Oct	152,400	23,095	496	4,829
	Nov	160,080	23,039	486	4,713
	Dec	163,920	24,290	501	5,490
2007	Jan	159,360	23,597	486	5,365
	Feb	166,080	24,584	503	5,530
	Mar	159,120	23,636	511	5,496
	Apr	160,560	22,830	494	4,665
	May	158,880	22,741	505	4,733
	Jun	137,040	20,205	500	4,684
	Jul	103,440	13,828	244	2,187
	Aug	101,760	13,695	250	2,228
	Sep	140,400	19,990	456	4,120
	Total	**2,120,880**	**$307,744**	**6,406**	**$63,373**
Mo	Avg	141,392	$20,516	427	$4,225
Avg	$/kW		$0.15		

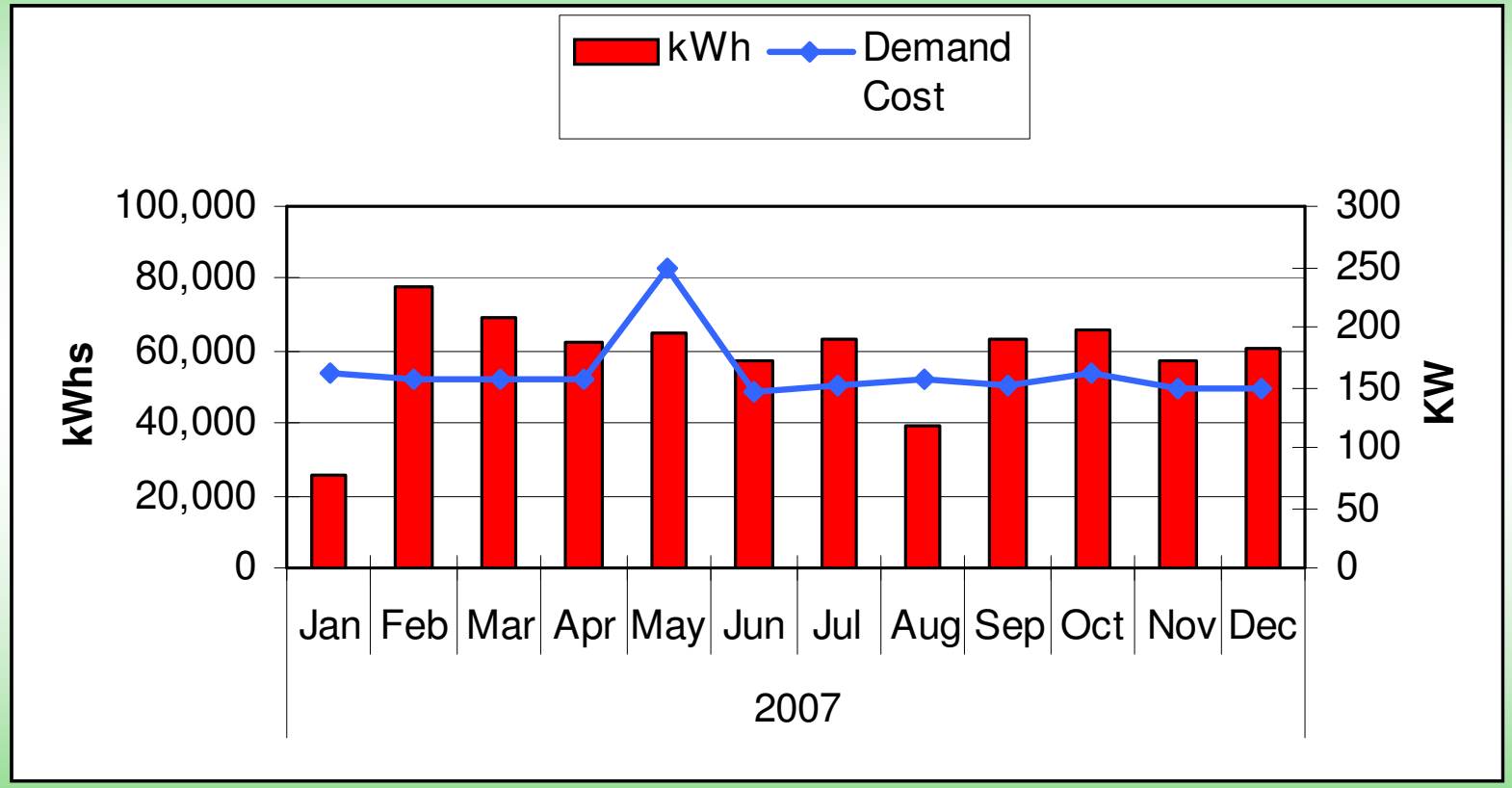




Demand Charge

- **What is the Demand Charge?** The demand meter constantly measures electrical energy consumption.
- The demand charge is based on the highest amount of energy used in any given 15 minute period during the typical 30 day billing cycle

Example of an Unknown Demand Increase at Water Utility

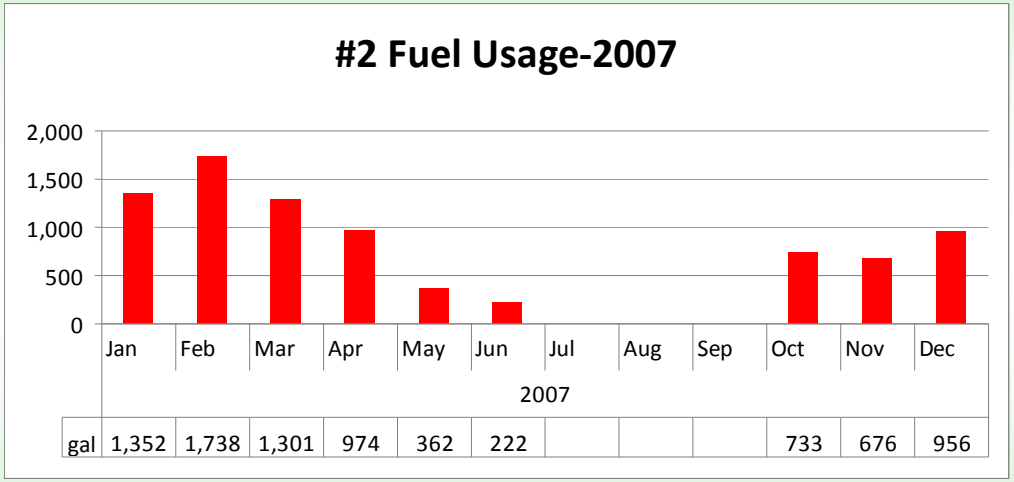


Demand charge to start 75 HP motor for water main break Cost=>$700

Electricity Usage-2007					
		kWh	Cost	Demand Use KW	Demand cost
2007	Jan	26,000	4,544	162	1,681
	Feb	77,800	10,124	156	1,618
	Mar	69,000	8,909	156	1,541
	Apr	62,200	7,784	156	1,193
	May	64,800	8,772	249	1,907
	Jun	57,200	7,191	147	1,128
	Jul	63,400	7,824	152	1,112
	Aug	39,200	7,661	156	1,139
	Sep	63,600	7,837	152	1,204
	Oct	65,400	8,096	161	1,174
	Nov	57,600	7,180	148	1,077
	Dec	61,000	7,870	148	1,408
	Total	**707,200**	**$93,792**		**$16,182**
Avg	mo	58,933	$7,816		
Avg	$/kW		$0.13		

Gather Fuel Consumption Data

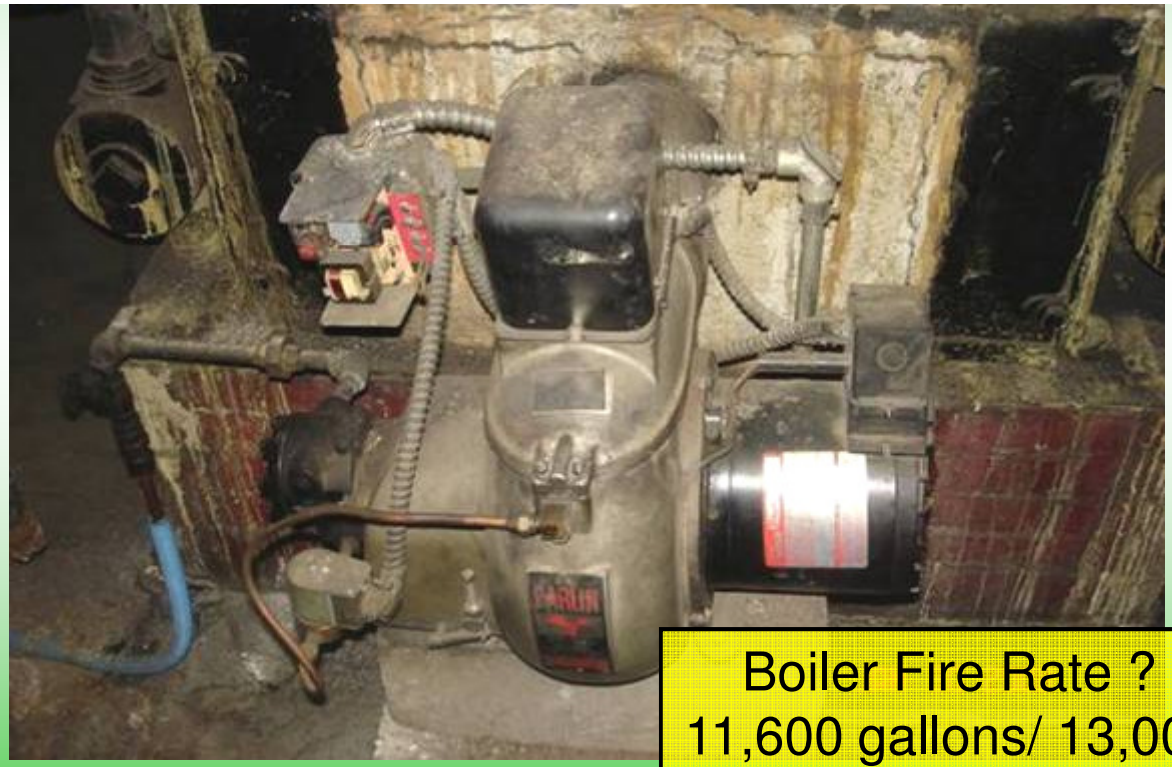
#2 Fuel Usage-2007			
		gal	cost
2007	Jan	1,352	3168
	Feb	1,738	4073
	Mar	1,301	3050
	Apr	974	2283
	May	362	849
	Jun	222	520
	Jul		
	Aug		
	Sep		
	Oct	733	520
	Nov	676	1564
	Dec	956	2109
	Total	**8,314**	**$18,136**
Monthly	Average	924	$2,015
$ per gal	Average		$2.18



Typical audit recommendation to reduce fuel cost - outside reset sensor on boiler

Example outside reset sensor: February day at 40°F and the target boiler temperature was 136°F – which is significantly less than 180-200°F which would have been without the sensor.

Energy Audits find problems such as these 13,000 SF light manufacture and office building



Boiler Fire Rate ? gal/hr
11,600 gallons/ 13,000 SF =
0.9 gals/SF

Lighting 101

- Fluorescent tube lighting:
  - T 12 =1 ½
  - T 8 = 1 inch
  - T 5 = <1 inch

Note: If your fluorescent lighting has not been upgraded in the last 10 years then it is most likely T-12

Bath Water District Lighting

	Location	Fixture type	# of fix's	Watts per Fixture	Daily Total kWh	Hrs/ Day	# of Days	Annual Op Hours	Yearly Total kWh	Annual Cost @$.15kWh	Potential Annual Savings	Annual kWh Saved
Existing	Chem Handlers	Metal Halide	2	450	0.9	4	365	1,460	1,314	$197		
Retrofit	Chem Handlers	4L 2x4 T8	2	150	0.3	4	365	1,460	438	$66	$131	876
Existing	shop	2L 2x4 T12	12	75	0.9	1	365	365	329	$49		
Retrofit	shop	occupancy sensors reduce on time-99%	12	75	0.9	0.1	365	37	33	$5	$44	296
Existing	stairs	2L 2x4 T12	5	75	0.375	24	365	8,760	3,285	$493		
Retrofit	stairs	2L 2x4 T8 occupancy sensors-reduce on time-95%	5	50	0.25	1	365	365	91	$14	$479	3,194
Existing	high lift pump room	2L 2x4 T12	9	75	0.675	4	365	1,460	986	$148		
Retrofit	high lift pump room	2L 2x4 T8 occupancy sensors-reduce on time-75%	9	50	0.45	1	365	365	164	$25	$123	821
Existing	Flouride Room	2L 2x4 T12	1	75	0.075	1	365	365	27	$4		
Retrofit	Flouride Room	2L 2x4 T12 occupancy sensors-reduce on time-95%	1	75	0.075	0.05	365	18	1	$0	$4	26
Existing	Process room	2L 2x4 T12	16	75	1.2	4	365	1,460	1,752	$263		
Retrofit	Process room	2L 2x4 T12 occupancy sensors-reduce on time-90%	16	50	0.8	0.5	365	183	146	$22	$241	1,606
Existing	lab	2L 2x2 T12 utubes	4	75	0.3	8	365	2,920	876	$131		
Retrofit	lab	2L 2x2 T8 occupancy sensors-reduce on time-75%	4	50	0.2	2	365	730	146	$22	$110	730
Existing	kitchen	2L 2x2 T12 utubes	4	75	0.3	4	365	1,460	438	$66		
Retrofit	kitchen	2L 2x2 T8 occupancy sensors-reduce on time-90%	4	50	0.2	1	365	365	73	$11	$55	365
Existing	control room	2L 2x2 T12 utubes	4	75	0.3	8	365	2,920	876	$131		
Retrofit	control room	2L 2x2 T8 occupancy sensors-reduce on time-50%	4	50	0.2	4	365	1,460	292	$44	$88	584
									Yearly Total kWh	Annual Cost @$.15kWh	Potential Annual Savings	Annual kWh Saved
									9,882	**$1,482**	**$1,275**	**8,498**

Freeport Sewer District

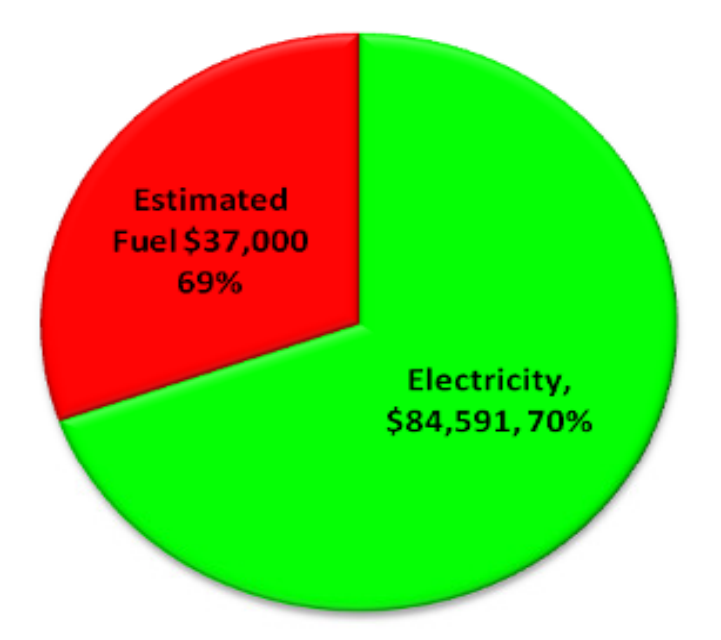
	Location	Fixture type	# of fixture	Watts per Fixture	Daily Total kWh	Hrs/ Day	# of Days	Annual Operating Hours	Annual Total kWh	Annual Cost @ $.15kWh	Potential Annual Savings	Annual kWh Saved
Existing	Head Works Bldg	3L 2x8 T12's	9	114	1.026	3	260	780	800	$120		
Retrofit	Head Works Bldg	Occupancy sensor 75%	9	140	1.26	1	260	260	328	$49	$71	473
Existing	Blower motor room	2L 1x8 T12's	5	75	0.375	8	260	2080	780	$117		
Retrofit	Blower motor room	Occupancy sensor 75%	5	75	0.375	2	260	520	195	$29	$88	585
Existing	Process Room / Shop	2L 1x8 T12's	17	75	1.275	8	260	2080	2,652	$398		
Retrofit	Procees Room / Shop	occupancy sensors 50%	16	75	1.2	4	260	1040	1,248	$187	$211	1,404
Existing	Chemical Feed Room	4L 1x4 T12's	5	140	0.7	8	260	2080	1,456	$218		
Retrofit	Chemical Feed Room	sensor 50%	5	140	0.7	4	260	1040	728	$109	$109	728
Existing	Office	3L 2x8 T8's	24	80	1.92	8	260	2080	3,994	$599		
Retrofit	Office	Occupancy sensor 15%	24	80	1.92	7	260	1820	3,494	$524	$75	499
									Annual Total kWh	Annual Cost @ $.15kWh	Potential Annual Savings	Annual kWh Saved
Estimated Annual Lighting Savings									$9,682	$1,452	$478	3,190
Estimated Carbon Dioxide (CO2) Savings Tons Per Year												2.5

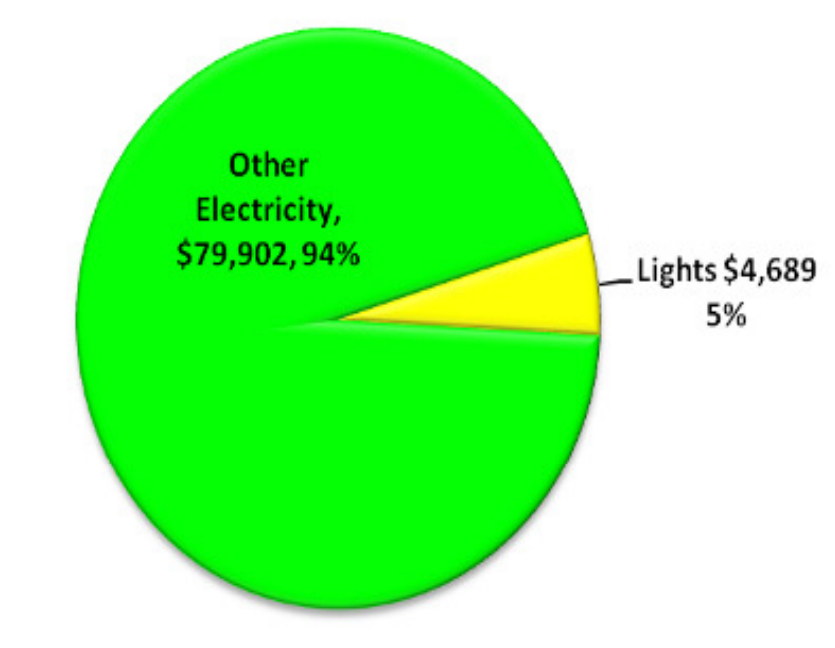
Example of Potential Annual Lighting Savings

Brunswick & Topsham Water District Summary Lighting Table														
	Location	Fixture type	# of units	Watts per Unit	Daily Total kW	Hrs/ Day	# of Days	Annual Operating Hours	Annual Total kWh	Annual kWh Cost	Potential Annual Savings	Annual kWh Saved	Annual kW Saved
										$0.1263			
TOTAL Estimated Annual Lighting Savings									37,126	$4,689	$2,953	23,379	0.94
Estimated Carbon Dioxide (CO2) Savings Tons Per Year												18.4	
Annual KW saved will amount to additional savings of the demand charge of approximately $80 per year.													

	Location	Fixture type	# of units	Watts per Unit	Daily Total kW	Hrs/ Day	# of Days	Annual Operating Hours	Annual Total kWh	Annual kWh Cost	Potential Annual Savings	Annual kWh Saved	Potential Reduced KW
										$0.10			
TOTAL Estimated Annual Lighting Savings									233,498	$24,423	$21,253	212,525	15
Estimated Carbon Dioxide (CO2) Savings Tons Per Year												166.8	

Water Utility Energy Break Down





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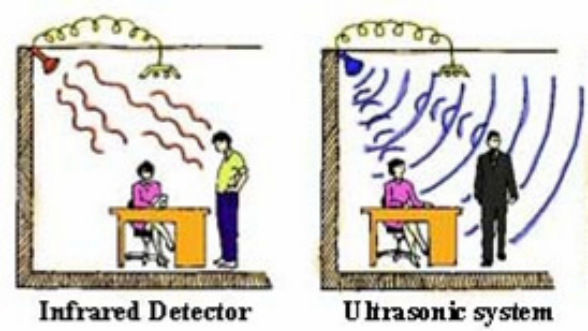
Lighting $ensors $ave Energy



Lighting controlled by occupancy sensors. This is a great energy saving feature.

There are basically two types:

<u>Passive Infrared (PIR)</u> which responds to changes in infrared background by movements in the area

<u>Ultrasonic (US) units</u> which generate high frequency sound waves to monitor changes in the signal return to detect occupancy.

Sensors save energy

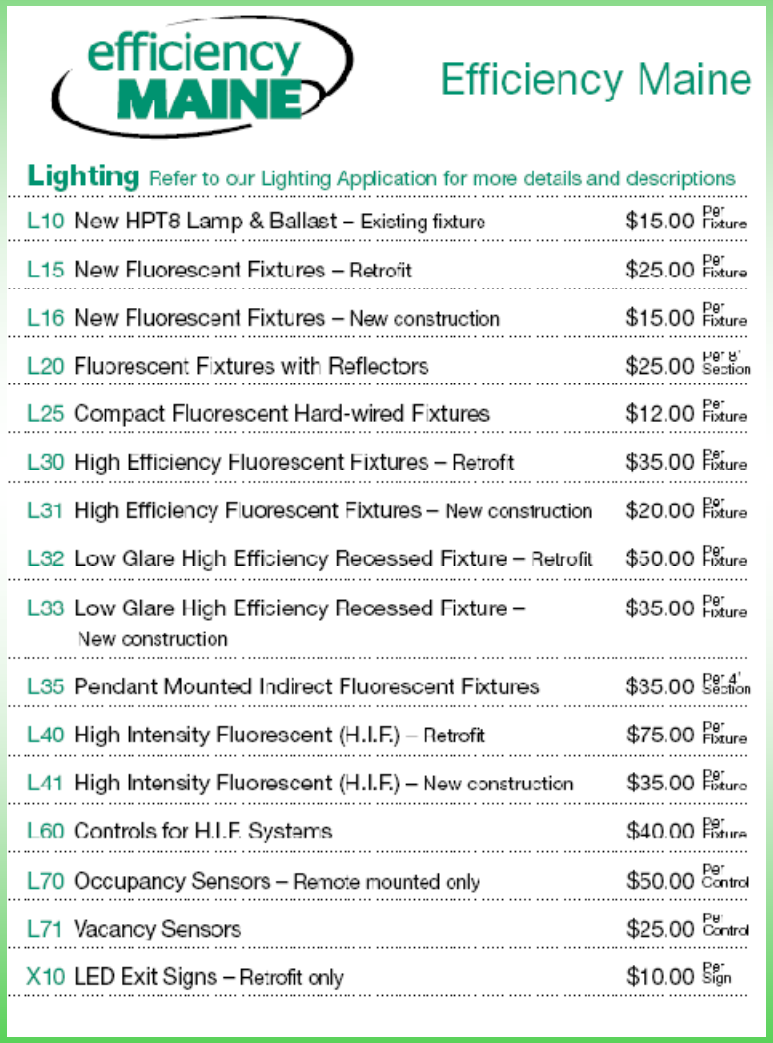
Add sensors to existing T-8 lighting in shop that will automatically shut off lights when the area is not occupied.

Lighting Incentives

Rule of Thumb

HOT8 < 20 Feet
T5's > 25 feet

Are Foot Candles or Lux measurements important?



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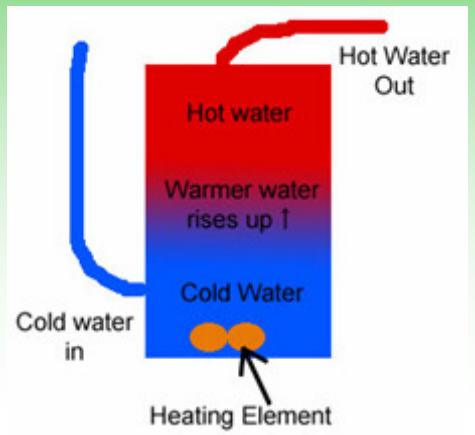
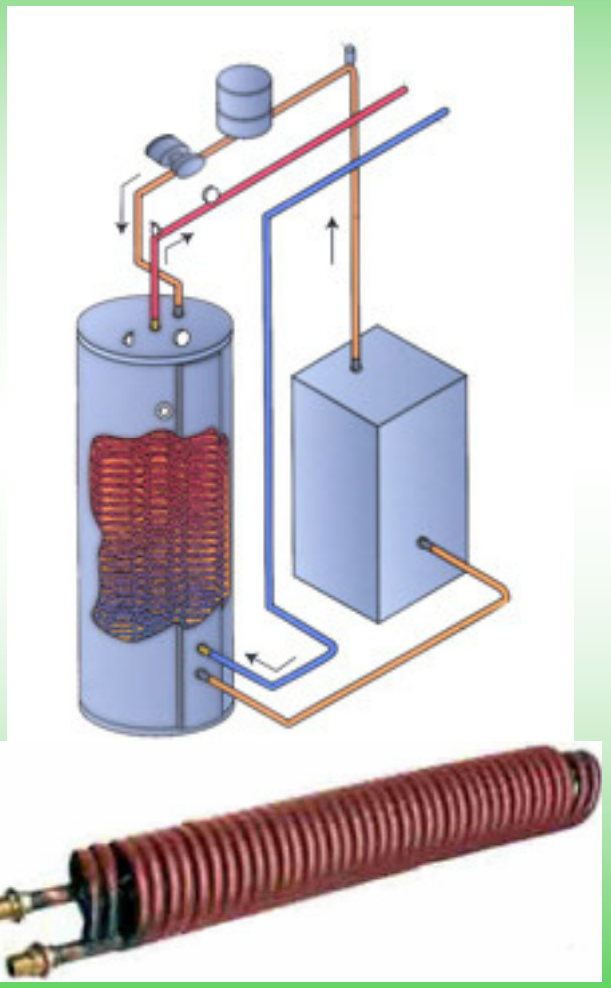
Lighting Refer to our Lighting Application for more details and descriptions

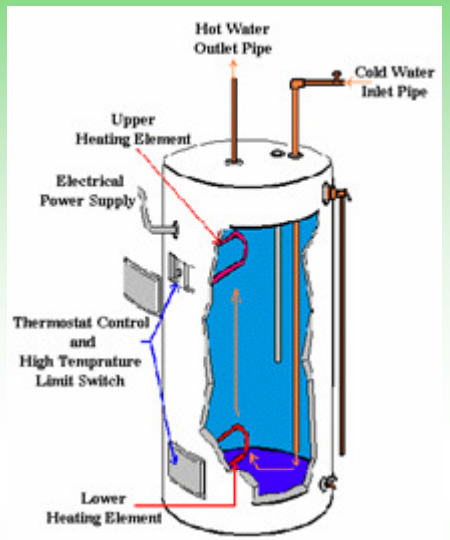
L10	New HPT8 Lamp & Ballast – Existing fixture	$15.00 Per Fixture
L15	New Fluorescent Fixtures – Retrofit	$25.00 Per Fixture
L16	New Fluorescent Fixtures – New construction	$15.00 Per Fixture
L20	Fluorescent Fixtures with Reflectors	$25.00 Per 8' Section
L25	Compact Fluorescent Hard-wired Fixtures	$12.00 Per Fixture
L30	High Efficiency Fluorescent Fixtures – Retrofit	$35.00 Per Fixture
L31	High Efficiency Fluorescent Fixtures – New construction	$20.00 Per Fixture
L32	Low Glare High Efficiency Recessed Fixture – Retrofit	$50.00 Per Fixture
L33	Low Glare High Efficiency Recessed Fixture – New construction	$35.00 Per Fixture
L35	Pendant Mounted Indirect Fluorescent Fixtures	$35.00 Per 4' Section
L40	High Intensity Fluorescent (H.I.F.) – Retrofit	$75.00 Per Fixture
L41	High Intensity Fluorescent (H.I.F.) – New construction	$35.00 Per Fixture
L60	Controls for H.I.F. Systems	$40.00 Per Fixture
L70	Occupancy Sensors – Remote mounted only	$50.00 Per Control
L71	Vacancy Sensors	$25.00 Per Control
X10	LED Exit Signs – Retrofit only	$10.00 Per Sign

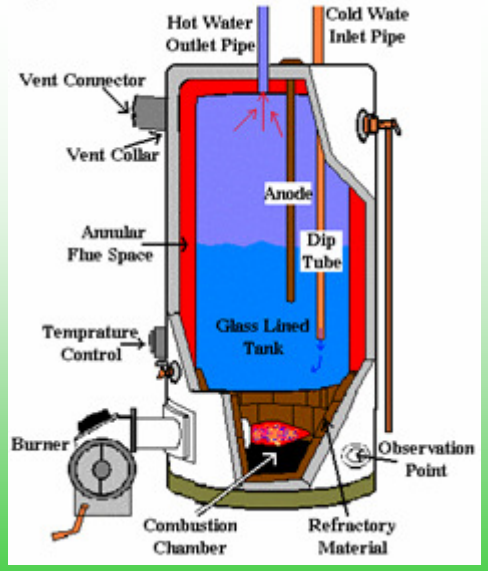
Conservation Measures for Old Lighting

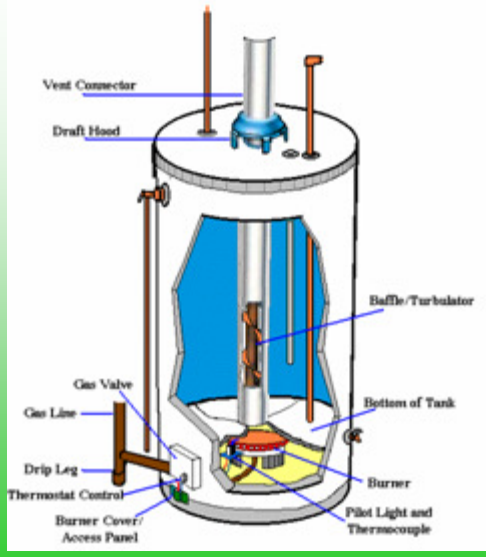
Audit looks at Typical Domestic Hot Water Production









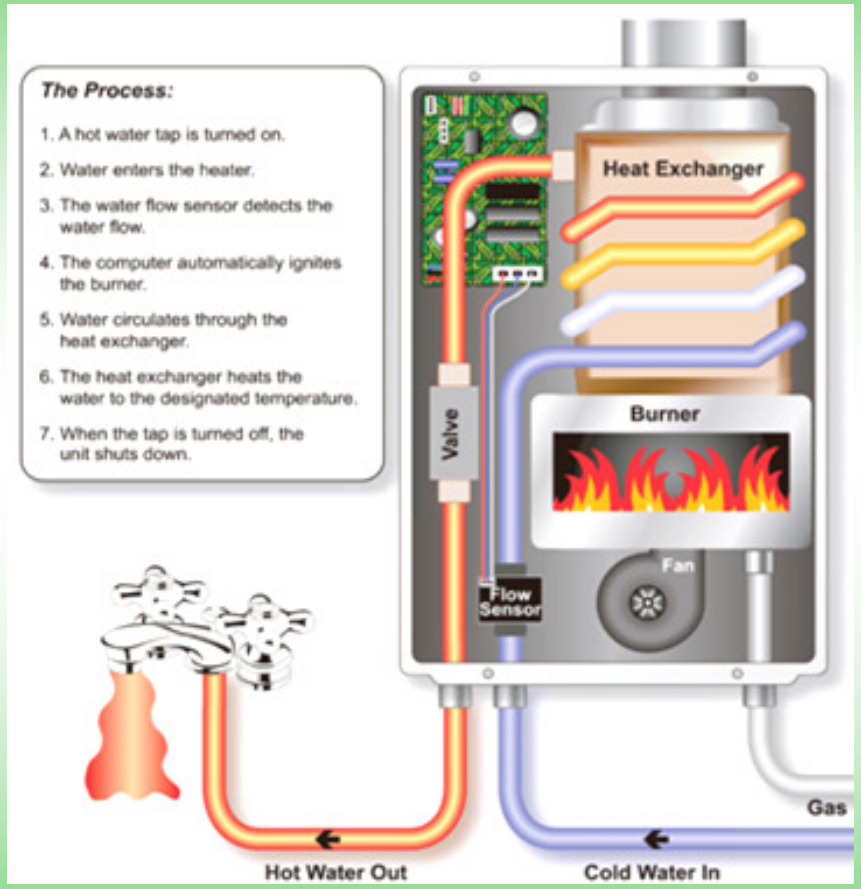


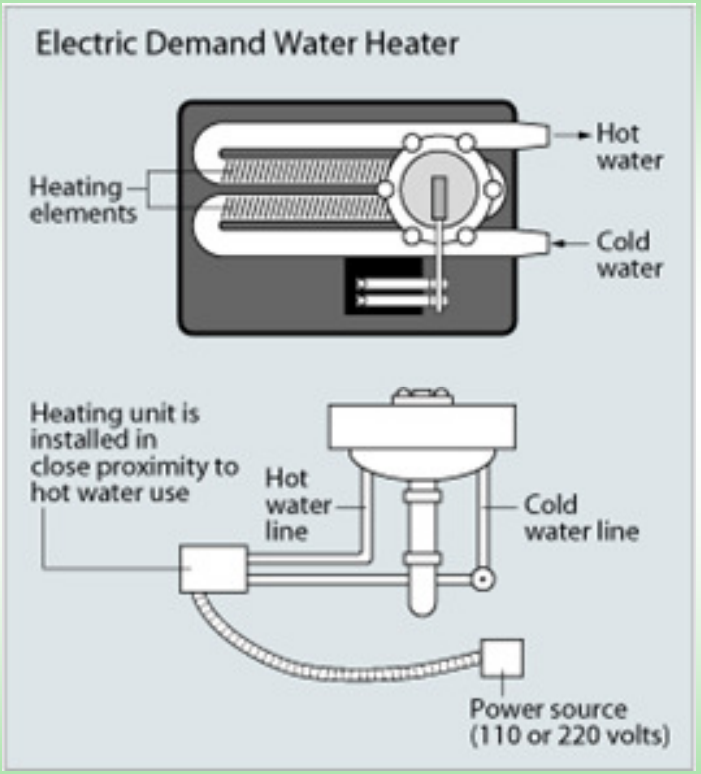
3/19/2010

Typical Audit Energy Conservation Measure Recommendation
On-Demand Tankless Water Heaters

- Heat water directly without the use of a storage tank
- When hot water tap is turned on, cold water travels into the unit and an electric element or gas fired coil heats the water. You only consume energy when you open the faucet
- No standby heat losses. Delivers a constant supply of hot water
- Two types:
  - **Electric:** provide approximately 2 -6 gallons per minute
  - **Gas-fired:** produce higher flow rates between 5 - 13 gallons per minute (must have large domestic hot water demand to justify cost)

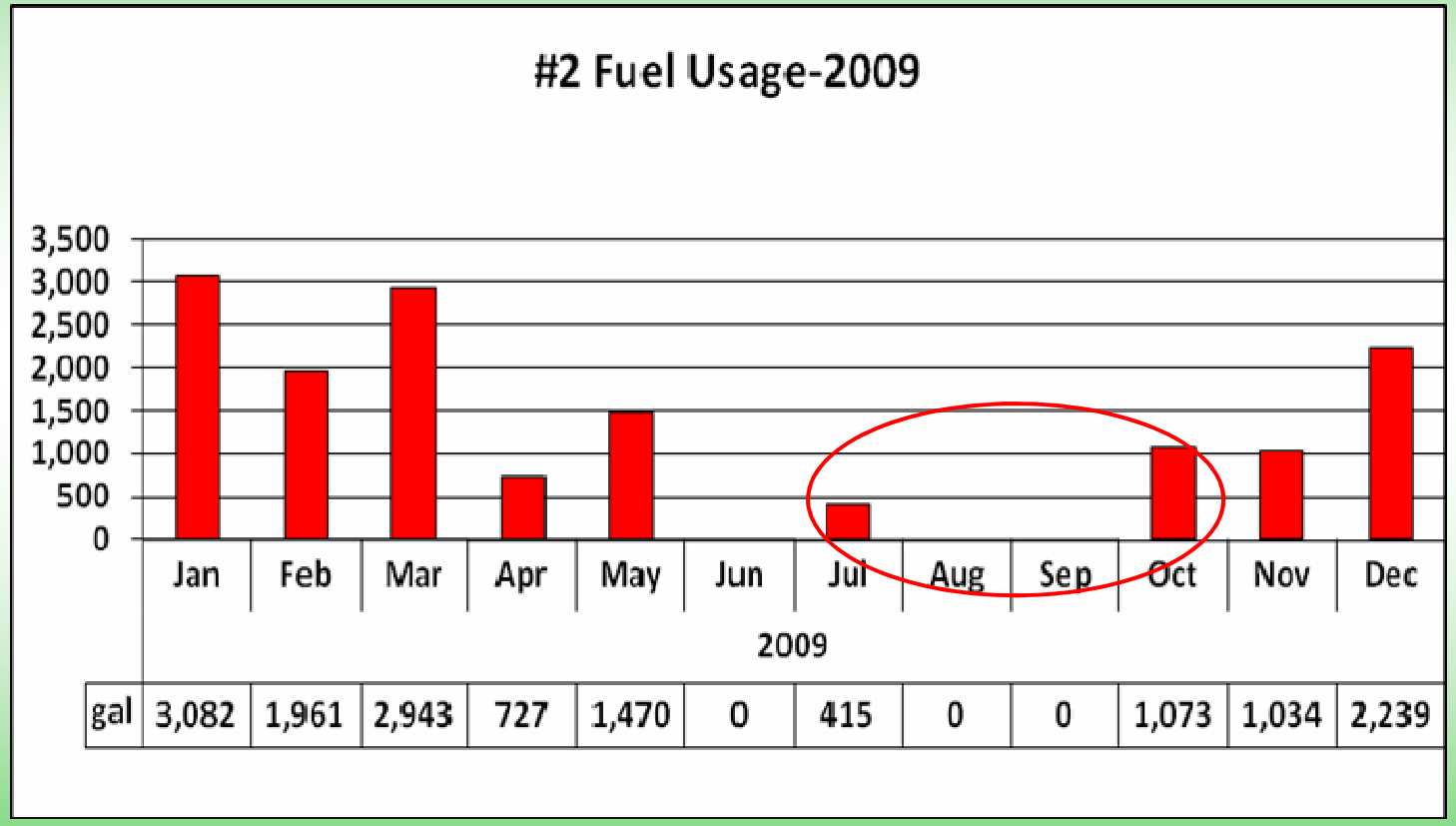
On Demand Tankless Hot Water Heaters



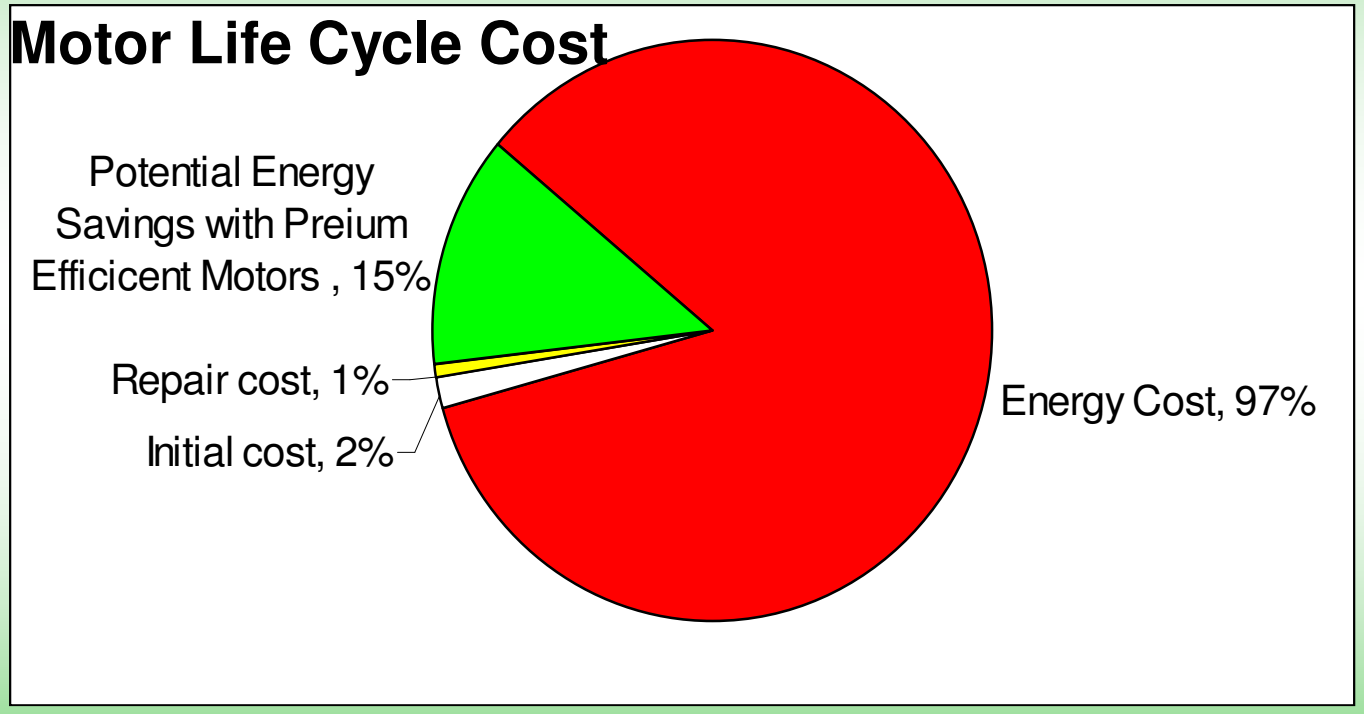


Gas fired: $1000- $2000 plus installation
Electric: $200- $800 plus installation

Fuel Consumption over 1,400 gallons of fuel oil for domestic hot water during non heating season at waste water facility

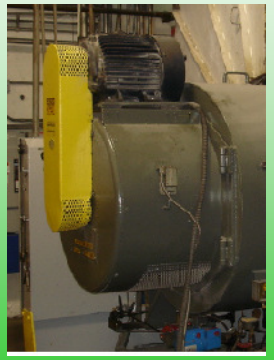


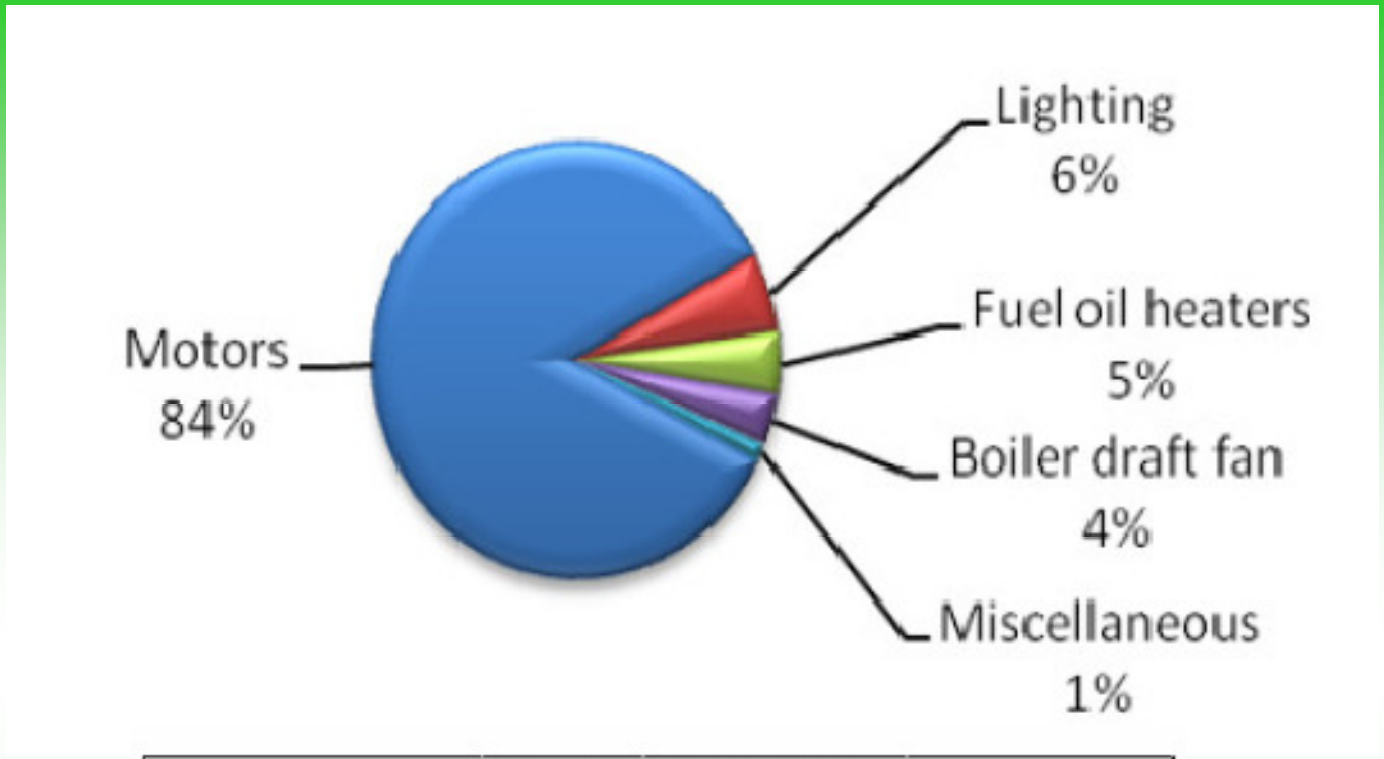
Motor efficiency matters



Example of Motor Recommendation

Boiler Forced Draft Fan Motor												
	Location	Fixture type	# of units	Watts per unit	Daily Total kW	Hrs/ Day	# of Days	Annual Operating Hours	Yearly Total kWh	Annual Cost @ $.11 kWh	Potential Annual Savings	Annual kWh Saved
Existing	Restrooms	25 HP Forced Draft Fan Motor	1	17,000	17	24	365	8760	148920	$16,381		
Retrofit		Add Varible Frequency Drive estimate annual savings 20%	1	13,500	13.5	24	365	8760	118260	$13,009	$3,373	30660
									Yearly Total kWh	Annual Cost @ $.1565kWh	Potential Annual Savings	Annual kWh Saved
									148920	$16,381	$3,373	30,660
											Estimated Carbon Dioxide (CO2) Savings Tons Per Year	24.1
The assumption is the VFD deliver an annual estimated savings of approximately 20%.												
It is assumed boiler fires 24/7. There are two boilers each with a forced draft fan. It was reported that only one boiler fires at a time.												





Plant Electrical Usage			
Type	kWh	cost @ $.10 kW	% of electric bill
Motors	3,521,812	$352,181	85%
Lighting	233,498	$23,350	6%
Fuel oil heaters	183,960	$18,396	4%
Boiler draft fan	148,920	$14,892	4%
Miscellaneous	50,000	$5,000	1%
Total estimated usage	4,138,190	$413,819	99%
Total from electric bill	4,195,200	$419,520	100%
Estimated annual electrical energy consumption for plant			
There were no measurements of energy consumption			
Estimates derived by a walk-through audit, data plates and reported use			

Estimated Motor Consumption								
Motor HP	# of motors	Estimated watts per motor	KW per motor	Hours per day	kWh's per day	Days	Total kWh's	Est cost per kWh
								0.1
1	8	675	0.7	10	6.8	312	16,848	$1,685
2	18	1,350	1.4	10	13.5	312	75,816	$7,582
3	21	2,025	2.0	10	20.3	312	132,678	$13,268
5	19	3,375	3.4	10	33.8	312	200,070	$20,007
7.5	14	5,063	5.1	10	50.6	312	221,130	$22,113
10	5	6,750	6.8	10	67.5	312	105,300	$10,530
15	11	10,125	10.1	10	101.3	312	347,490	$34,749
20	9	13,500	13.5	10	135.0	312	379,080	$37,908
25	6	16,875	16.9	10	168.8	312	315,900	$31,590
30	8	20,250	20.3	10	202.5	312	505,440	$50,544
40	2	27,000	27.0	10	270.0	312	168,480	$16,848
50	6	33,750	33.8	10	337.5	312	631,800	$63,180
60	1	40,500	40.5	10	405.0	312	126,360	$12,636
70	2	47,250	47.3	10	472.5	312	294,840	$29,484
			KW				Total kWh's	Est annual cost
			228				3,521,232	$352,123

The motors above represent the motors in the plant.

A simple assumption of 750 watts per HP x 90% was used to develop the estimated usage. It does not take into account motor efficiencies or phasing.

There were no actual measurements taken or detailed motor usage obtained. Assumption is motors run 10 hours per day for 6 days a week.

It was not determined how many motors have varible frequency drives (VFD). It is noted that there are a number of motors in the plant with VFD's.

Efficiency Maine Cash Incentives

Variable Frequency Drives For HVAC Application

Cumulative Motor HP Controlled by each VFD	Maximum Incentive
7.5	$1,700.00
8	$1,730.00
9	$1,760.00
10	$1,800.00
11	$1,840.00
12	$1,880.00
13	$1,920.00
14	$1,960.00
15	$2,000.00
16	$2,100.00
17	$2,200.00
18	$2,300.00
19	$2,400.00
20	$2,500.00

VFD Incentives are available for other applications using the Custom Incentive Application form.

Efficiency Maine
Pete Laiho

Replacement Motor Cash Incentives

NEMA Premium® Efficiency Motors Open Drip-Proof Motor	
1 & 1.5HP	$ 45.00
2, 3 & 5HP	$ 54.00
7.5HP	$ 81.00
10HP	$ 90.00
15HP	$104.00
20HP	$113.00
25HP	$117.00
30HP	$135.00
40HP	$162.00
50HP	$198.00
60HP	$234.00
75HP	$270.00
100HP	$360.00
125HP	$540.00
150HP & 200HP	$630.00

NEMA Premium® Efficiency Motors Enclosed Fan-Cooled Motor	
1 & 1.5HP	$ 50.00
2, 3 & 5HP	$ 60.00
7.5HP	$ 90.00
10HP	$100.00
15HP	$115.00
20HP	$125.00
25HP	$130.00
30HP	$150.00
40HP	$180.00
50HP	$220.00
60HP	$260.00
75HP	$300.00
100HP	$400.00
125HP	$600.00
150HP & 200HP	$700.00

Thoughts of VFD’s

VFD vs. Control Valve

- A variable frequency drive, used in lieu of a control valve to restrict pump output.
- Often demonstrates a significant financial benefit.
- To reduce downstream flow, or pressure, part of the energy imparted to the fluid by the pump is given up in a control valve in the form of heat, noise, and vibration.
- A VFD offers a more efficient alternative to the control valve in a system where the pump head is primarily driven by friction resistance to flow.

Goldilocks

- To borrow an analogy from Goldilocks and the Three Bears
- Sometimes an application doesn't need the highest performance solution or the lowest performance solution.
- Sometimes mid-level performance is just right.

VFD Justification

- Variable frequency drives (VFD's) are often promoted as money saving solutions for centrifugal pump applications.
- For some applications this is true.
- For other applications VFD's may be an unnecessary expense.

VFD or Control Valve
Understand Local Conditions

- If the pump operates at the reduced flow rate because it is oversized for the system
- The best way to save money might be to eliminate the control valve by replacing the oversized pump with one of the correct size.
- If the low flow condition occurs for short durations and relatively infrequently, then the control valve might be the most economical choice.

Other Considerations

- Motors operated by VFD's run hotter than motors operated across the line.
- Heat deteriorates motor insulation over time.
- When supplying motors for variable frequency operation, manufacturers typically use more expensive motors with a higher insulation class than motors used in a similar non-drive application.

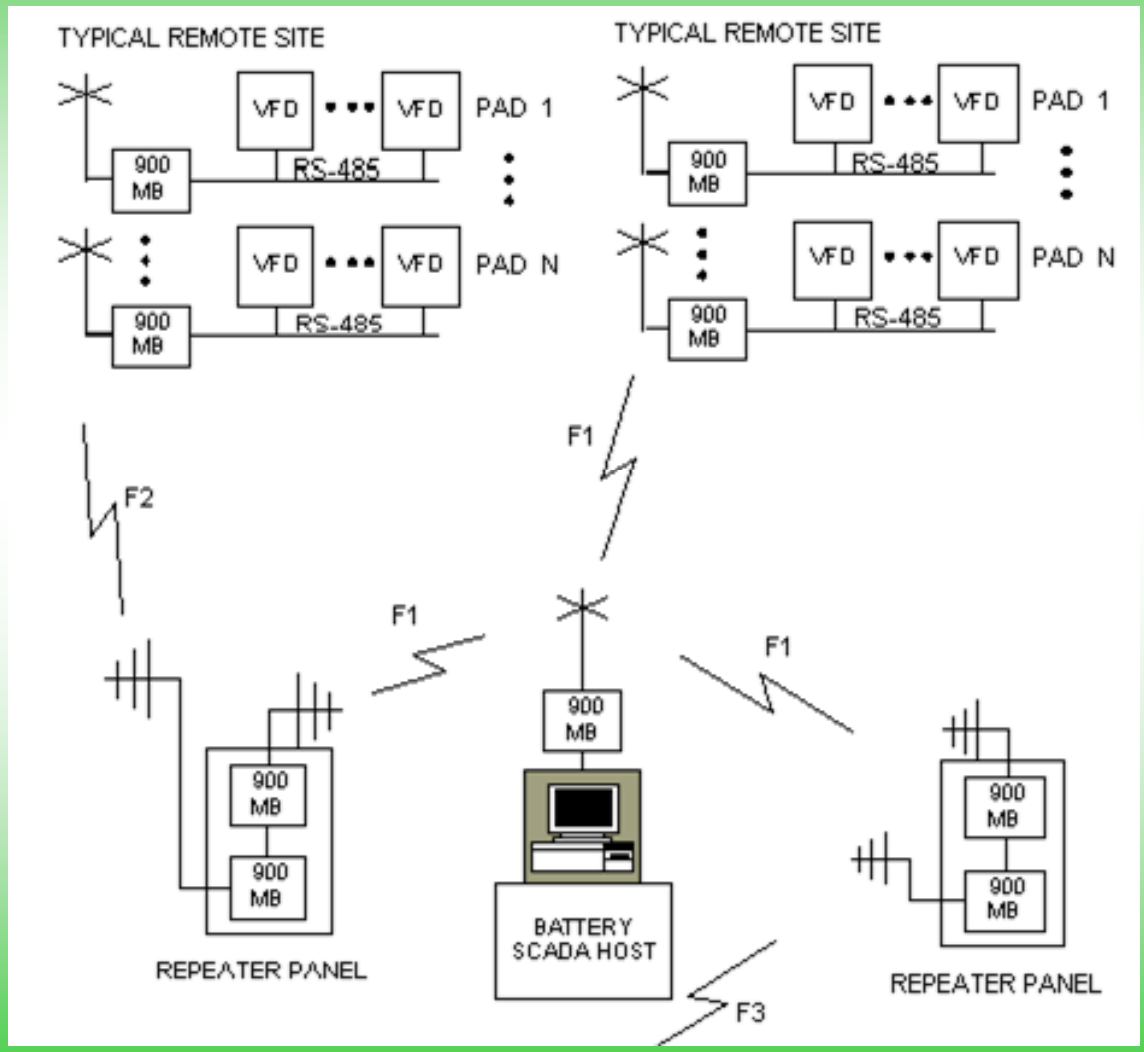
Heat

- The motor manufacturer should be consulted for operational limitations.
- Most variable frequency drives restrict the minimum continuous speed to some percentage of the nameplate speed.
- Below this minimum speed, temperature rise may damage the motor.
- Every 50^{o} F rise above the rated temperature in a motor reduces the insulation life by **half.**

Explosion Proof

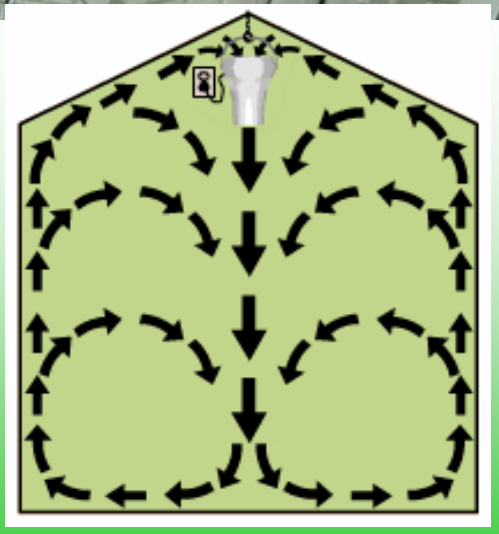
- Explosion proof motors must be rated as certified for VFD operation before they can be used with a VFD.
- Qualified motors will state on the nameplate that they are certified as explosion proof for VFD operation, as well as any operational limitations.

SCADA control for remote VFD's



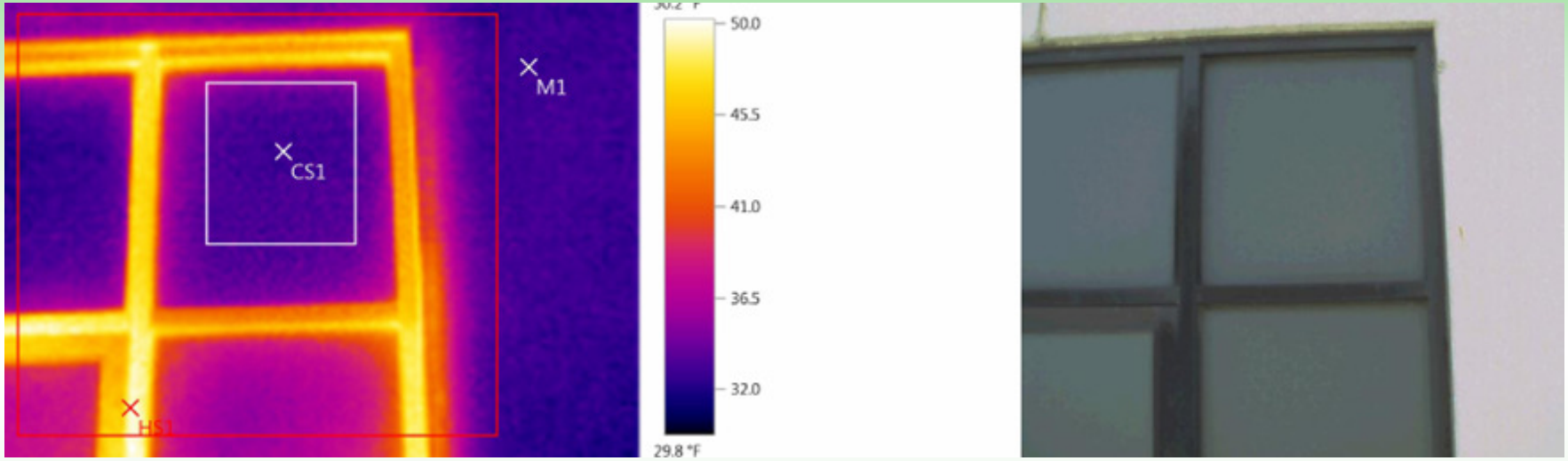
Airius Thermal Equalizers

- Stabilize the air column temperature during the winter and summer months
- Leads to reduced heat/cool on/off cycle that is typical in high bay spaces.
- Thermostats are typically installed at five feet above the floor.
- Rooms with high ceilings heat the entire air column to satisfy the thermostat setting.
- Peak ceiling temperature are 5 to 10 degrees warmer than the floor.
- Thermal equalization enhances comfort and reduces energy consumption.
- This technology can be viewed at: http://www.mainegreenbuilding.org/Instance-20.html



Airius Thermal Equalizers							
Model	Height	Diameter	Weight	Watts @ 60 Hz	Volts	Coverage*	Ceiling Height*
10	22 in.	13 in.	12 lbs.	15	120/230	1200 sq. ft.	Up to 12 feet
15	22 in.	13 in.	12 lbs.	17	120/230	1200 sq. ft.	Up to 18 feet
25	22 in.	13 in.	12 lbs	35	120/230/277	1200 sq. ft	Up to 30 feet
35	22 in.	13 in.	12 lbs.	76	120/230/277	1200 sq. ft.	Up to 40 feet

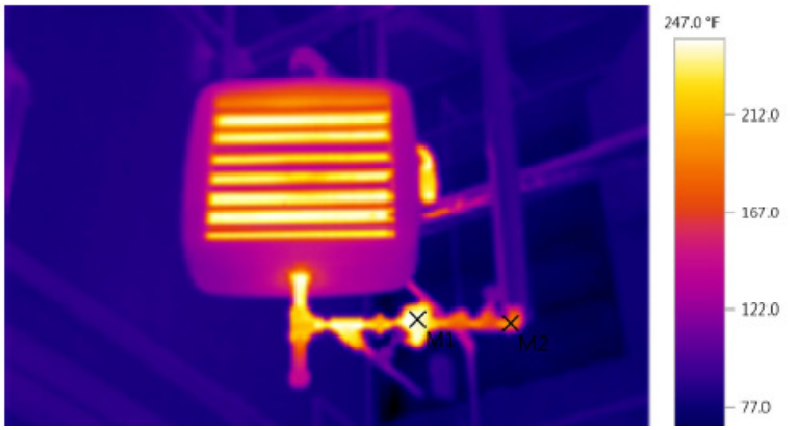
Exterior door panel



Picture markings:

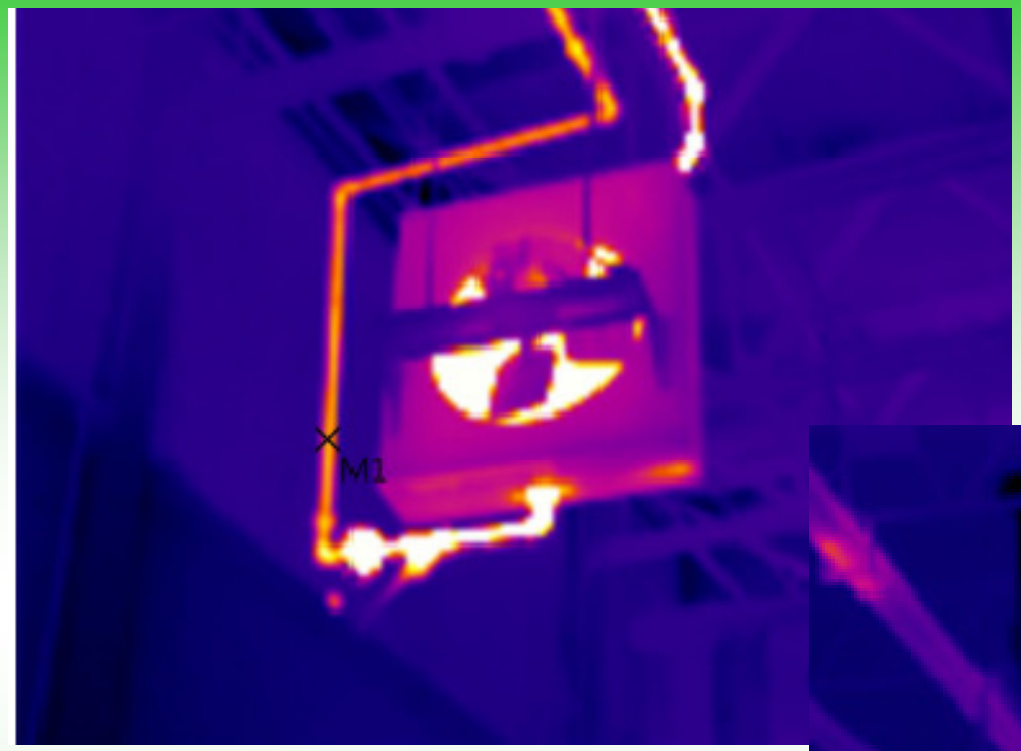
Measurement Objects	Temp. [°F]	Emiss.	Refl. temp. [°F]	Remarks
Measure point 1	29.8	0.95	68.0	Exterior wall temperature
Cold spot 1	32.2	0.95	20.0	Insulated panel temp
Hot spot 1	49.9	0.95	20.0	Door metal frame temp

Steam trap maintenance

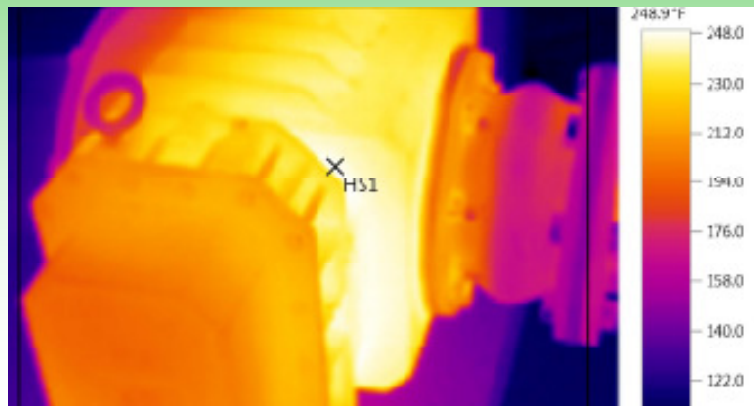


Picture markings:

Measurement Objects	Temp. [°F]	Emiss.	Refl. temp. [°F]	Remarks
Measure point 1	242.5	0.95	68.0	Steam Trap
Measure point 2	191.7	0.95	68.0	Condensate return line after steam trap

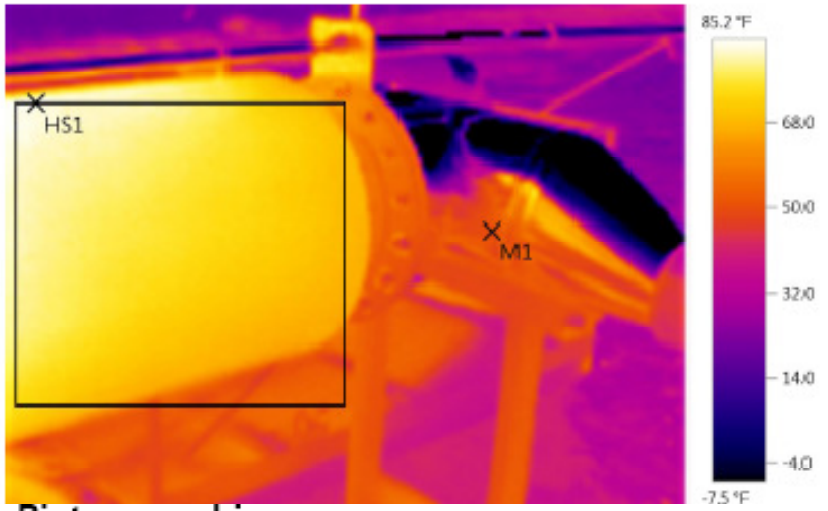

M1


M1



Picture markings:

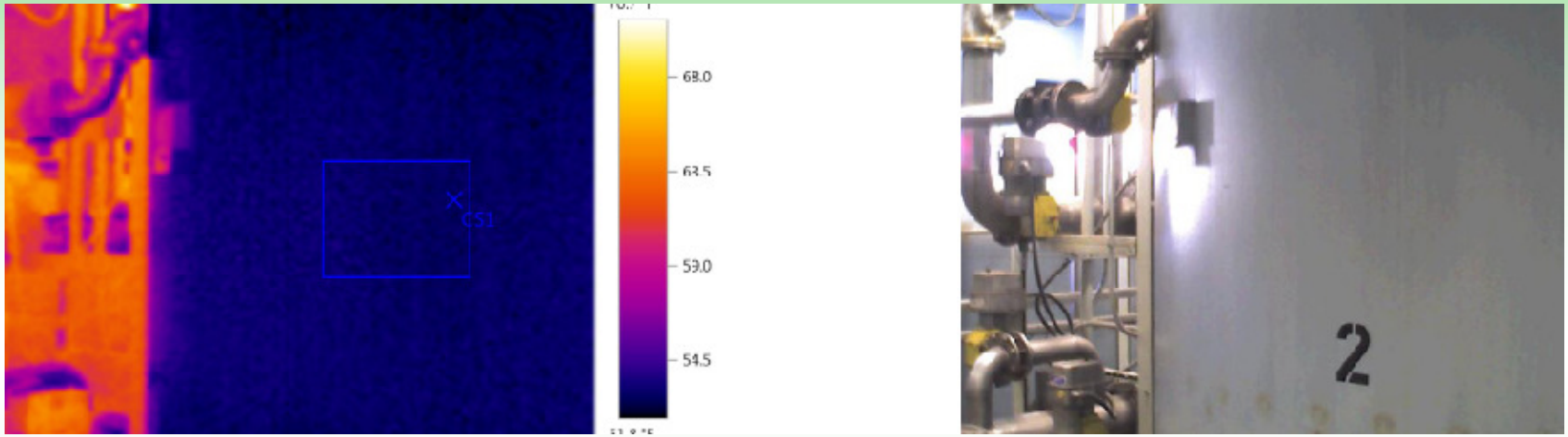
Measurement Objects	Temp. [°F]	Emiss.	Refl. temp. [°F]	Remarks
Hot spot 1	248.9	0.95	68.0	Blower at Clarifying Pond



Picture markings:

Measurement Objects	Temp. [°F]	Emiss.	Refl. temp. [°F]	Remarks
Measure point 1	50.2	0.95	68.0	Discharge pipe from header
Hot spot 1	85.2	0.95	68.0	Effluent header from blower room

Geo Thermal??



Picture markings:

Measurement Objects	Temp. [°F]	Emiss.	Refl. temp. [°F]	Remarks
Cold spot 1	52.2	0.95	68.0	Exterior temp of tank 2

Alternative Energy--is it a Panacea???

Photovoltaic

3.3 KW PV at Falmouth High School
(power one 5 HP motor)

Thermal

405,000 BTU's for thermal hot water per day
(equivalent to ~3 gals of fuel oil per day)

"No Cost" Small Business Energy Audit Requirements

- < 50 employees or $5 million in annual revenue
- Small Business and non- profits
- No facility engineers on staff
- Submit one year of energy bills
- One building, i.e. Town Hall or Public Works or Fire House
- Follow up in six months
- No schools or residential facilities
- **Call 207-373-1330 to set up an Audit**
- www.efficiencymaine.com/business_programs

The most important tool in the box

Did you know there is a computer that can save 100% of the energy cost associated with any given application?

The most important tool in the box

It's called the human brain, and when it is motivated, it can deliver impressive results.

For example, the energy saving is 100% when it decides to turn something off!

Thank You

Any questions, please do not hesitate to call

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